PIF1 HELICASE AND POLYMERASE ZETA (ζ) CHARACTERIZE TWO PATHWAYS OF MUTAGENESIS ASSOCIATED WITH BREAK INDUCED REPLICATION.

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The fidelity of DNA synthesis differs among the various processes in which it is involved. While normal S-phase DNA replication is highly accurate, DNA synthesis associated with DNA repair is often error-prone. Recently, we have analyzed the accuracy of Break-induced replication, which is a unique cellular process that mimics normal DNA replication in its processivity and rate, but is initiated at double-strand breaks (DSBs) rather than at replication origins. We have demonstrated that BIR is associated with approximately a thousand-fold increase of the rate of frameshift mutations as compared to spontaneous events. Here we have identified 5' – 3' helicase *Pif1p* and translesion polymerase Pol ζ as the two major components in promoting frameshift mutations associated with BIR. We have also employed a reversion assay using base substitution reporter *ura 3-29* to demonstrate that BIR elevates base substitution mutations by a fold of 400 over normal DNA replication.

This mutagenic character led us to explore the mode of repair synthesis associated with BIR.Our data suggests that BIR maybe following an unusual, conservative mode of synthesis very different from the usual semiconservative mode of synthesis followed by normal S-phase DNA replication.